

<b>Fiscal Year:</b>	FY 2017	<b>Task Last Updated:</b> FY 05/30/2017	
<b>PI Name:</b>	Dinges, David F. Ph.D.		
<b>Project Title:</b>	Psychomotor Vigilance Test (PVT) on ISS		
<b>Division Name:</b>	Human Research		
<b>Program/Discipline:</b>	HUMAN RESEARCH		
<b>Program/Discipline--Element/Subdiscipline:</b>	HUMAN RESEARCH--Behavior and performance		
<b>Joint Agency Name:</b>		<b>TechPort:</b>	Yes
<b>Human Research Program Elements:</b>	(1) <b>HFBP</b> :Human Factors & Behavioral Performance (IRP Rev H)		
<b>Human Research Program Risks:</b>	(1) <b>BMed</b> :Risk of Adverse Cognitive or Behavioral Conditions and Psychiatric Disorders (2) <b>Sleep</b> :Risk of Performance Decrements and Adverse Health Outcomes Resulting from Sleep Loss, Circadian Desynchronization, and Work Overload		
<b>Space Biology Element:</b>	None		
<b>Space Biology Cross-Element Discipline:</b>	None		
<b>Space Biology Special Category:</b>	None		
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<b>Comments:</b>			
<b>Project Type:</b>	FLIGHT	<b>Solicitation / Funding Source:</b>	Directed Research
<b>Start Date:</b>	08/01/2008	<b>End Date:</b>	12/31/2017
<b>No. of Post Docs:</b>	0	<b>No. of PhD Degrees:</b>	0
<b>No. of PhD Candidates:</b>	0	<b>No. of Master' Degrees:</b>	0
<b>No. of Master's Candidates:</b>	0	<b>No. of Bachelor's Degrees:</b>	0
<b>No. of Bachelor's Candidates:</b>	0	<b>Monitoring Center:</b>	NASA JSC
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<b>Flight Program:</b>	ISS		
<b>Flight Assignment:</b>	ISS NOTE: End date is now 12/31/2017 per K. Ohnesorge/JSC HRP (Ed., 3/9/17) NOTE: Element change to Human Factors & Behavioral Performance; previously Behavioral Health & Performance (Ed., 1/18/17) NOTE: End date is now 3/31/2017 per NSSC information (Ed., 5/5/14) NOTE: End date is now 7/31/2014 per PI (Ed., 5/3/2013) NOTE: start/end dates changed per J. Dardano/JSC --previously 4/30/2008-8/31/2013 (4/16/2009)		
<b>Key Personnel Changes/Previous PI:</b>			
<b>COI Name (Institution):</b>	Basner, Mathias ( University of Pennsylvania School of Medicine )		
<b>Grant/Contract No.:</b>	NNX08AY09G		
<b>Performance Goal No.:</b>			

<b>Performance Goal Text:</b>	<p>The Psychomotor Vigilance (PVT) Self Test (operational name on International Space Station (ISS) is Reaction Self Test (RST)) is intended to provide astronauts with objective feedback on neurobehavioral changes in vigilant attention, psychomotor speed, state stability, and impulsivity while on International Space Station (ISS) missions, as well as recording their subjective ratings of workload, sleep timing and quality, tiredness, fatigue, and stress. The PVT Self Test is suited for repeated use in spaceflight because unlike other cognitive tests, it is very brief (less than 5 minutes) while being free of learning effects and aptitude differences that make interpretation of other cognitive measures difficult. The ultimate goal of the Reaction Self Test project is to validate the sensitivity of the PVT Self Test on astronauts on ISS so they can use it to objectively identify when their performance capability is degraded by various fatigue-related conditions that can occur as a result of ISS operations and time in space. The following are the objectives (specific aims) of the project:</p>
<b>Task Description:</b>	<p>1) To evaluate the extent to which PVT Self Test performance of astronauts is sensitive to fatigue from sleep loss and circadian disruption during ISS missions. This will include the following conditions evaluated individually and in aggregate: i) extended wake duration above 16 hours; ii) sleep restriction defined as total sleep time &gt;0 and &lt;6 hours per 24-hour period; and iii) circadian perturbation associated with night work and slam shifting.</p> <p>2) To evaluate the extent to which PVT Self Test performance of astronauts is sensitive to fatigue from work intensity during ISS missions. This will include the following conditions evaluated individually and in aggregate: i) extend work durations up to 16 hours per day; ii) more than 6 consecutive work days without a day off for rest; and iii) work requiring extravehicular activity (EVA).</p> <p>3) To evaluate the extent to which PVT Self Test performance of astronauts declines with time in mission.</p> <p>4) To explore the extent to which PVT Self Test performance of astronauts will be sensitive to the carry-over effects of medications for sleep on ISS.</p> <p>5) To evaluate the extent to which PVT Self Test performance feedback (via a graphical interface) is perceived by ISS astronauts as a useful tool for assessing performance capability.</p>
<b>Rationale for HRP Directed Research:</b>	<p>The Principal Investigator (PI) developed the original 10-minute Psychomotor Vigilance Test (PVT), from which the Reaction Self Test was derived, to measure changes in psychomotor speed, lapses of attention, wake state instability, and impulsivity induced by fatigue and other performance-degrading factors commonly found in operational environments. Based on research supported by federal and non-US federal agencies, as well as the pharmaceutical industry, the 10-minute PVT has been extensively validated in laboratory studies, simulators, and operational environments to be sensitive to a variety of performance-degrading fatigue-related factors. There are currently more than 200 published peer-review papers on the sensitivity of the 10-min. PVT to fatigue-related factors. The Reaction Self Test is a 3-minute PVT Self Test that contains special timing and algorithm characteristics and that has been validated against the 10-minute PVT. The 3-minute Reaction Self Test will have utility in a wide array of safety-sensitive environments on Earth. Potentially any occupation in which alertness and fatigue management are essential to prevent errors on critical tasks will benefit from adaptations of the PVT SelfTest technology (e.g., certain military personnel, airport security screeners, physicians on night shifts and prolonged call).</p>
<b>Task Progress:</b>	<p>The final report for the N=24 astronauts investigated during 6-month ISS missions was submitted in April 2016. These astronauts performed 394 RST test bouts pre-flight, 2,109 test bouts in-flight, and 353 test bouts post-flight for a total of 2,856 test bouts.</p> <p>Data acquisition in the 1-year ISS mission subjects concluded with the last post-flight test bout in June 2016. Overall, 9 test bouts were collected pre-flight, 158 test bouts were collected in flight, and 6 bouts were collected post-flight for a total of 173 test bouts. Data analyses of the 1-year mission data is near completion and the final report is being prepared. Preliminary results were reported at a 1-Year Mission Investigator Working Group Meeting on March 28, 2017 at USRA (Universities Space Research Association) in Houston, TX.</p>
<b>Bibliography Type:</b>	Description: (Last Updated: 03/24/2024)
<b>Abstracts for Journals and Proceedings</b>	<p>Dinges DF, Basner M, Mollicone D, Ecker A, Jones CW, Mott C, Hyder EC, Di Antonio A, Dennis LE, Kan K. "PVT on ISS: reaction self-test (RST) from 6-month missions." Oral presentation at the 2017 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 23-26, 2017.</p> <p>2017 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 23-26, 2017. , Jan-2017</p>
<b>Articles in Peer-reviewed Journals</b>	<p>Boland EM, Rao H, Dinges DF, Smith RV, Goel N, Detre JA, Basner M, Sheline YI, Thase ME, Gehrman PR. "Meta-analysis of the antidepressant effects of acute sleep deprivation." J Clin Psychiatry. 2017 Sep/Oct;78(8):e1020-e1034. <a href="https://doi.org/10.4088/JCP.16r11332">https://doi.org/10.4088/JCP.16r11332</a> ; PubMed <a href="https://pubmed.ncbi.nlm.nih.gov/28937707/">PMID: 28937707</a> , Sep-2017</p>